# BIO-DYNAMICS

*A periodical furthering soil conservation and increased fertility in order to improve nutrition and health.*

## WINTER 1949


OBSERVATIONS ON BIO-DYNAMIC AND MINERAL TREATMENT OF SOIL ..... *Ehrenfried E. Pfeiffer*

NATURE'S COMPOST ..... *Henry I. Baldwin*

FAITH HOMESTEAD ..... *Helen Philbrick*

THE USE OF LIME IN B. D. COMPOSTING

D. H. I. A. TEST AT THREEFOLD FARM ..... *Ernest Daniel*

ANNOUNCEMENT REGARDING THE B. D. COMPOST STARTER

WE WEATHERED THE DROUGHT ..... *Esther Eaton*

THE GARDENER'S YEAR ..... *The Editors*

FROM OUR MAIL BAG ..... *Evelyn Speiden*



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# OBSERVATIONS ON BIO-DYNAMIC AND MINERAL TREATMENT OF SOIL

EHRENFRIED E. PFEIFFER

Last year our laboratory began soil and plant studies on an experimental plot fertilized with bio-dynamically treated manure and compost on one side, with mineral fertilizer on the other. The observations made the first year were reported in *Bio-Dynamics,* Vol. VIII, No. 1. It is our intention to continue this study for at least five years; if possible, for ten. Only then, can conclusions really be drawn. For the present, we cannot do more than report this year's results (1949). Our approach is entirely undogmatic, we are simply reporting facts. The few thoughts which we present, in addition, grow naturally out of these facts.

The soil selected for the plot was in sod, and had not received any treatment at all for several years prior to the beginning of the experiment. One section is kept as it was after the sods were removed. It lies fallow, or in a natural (weedy) cover. In the report this section is called "Blank." A second section is fertilized with mineral fertilizer. Agrico 5-10-5 was used this year at the rate of 2,900 lbs./acre. This section is called "Min." in this report. A third section was fertilized with bio-dynamically treated manure and compost, 1 part manure to 3 parts of compost. The rate of application of this mixture of manure and compost was 7.2 tons/acre. This section is called B.D. in the report.

The idea was to apply approximately equivalent amounts of NPK (nitrogen, phosphorus and potassium) to both the Min. and B.D. sections. In practice, for each pound of Agrico, 5 pounds of the B.D. manure and compost mixture were applied. The rate of application per acre represents amounts which we would use for growing field crops on a farm with this type of soil. To a certain extent, the mineral application favors the increase in available minerals (nitrates, phosphates, potassium). The B.D. application favors the increase of organic matter plus the minerals and minor elements contained naturally in the compost-manure mixture. This follows out of the nature of the fertilizing systems used. The available fraction of the mineral fertilizer is given by its formula 5-10-5, meaning 5% nitrogen, 10% phosphate, 5% potassium. The available fraction of these minerals in the organic fertilizer is quite a different matter. In fact, the figures here are much lower. But the point is, that in this case there is a high percentage of so-called "unavailables," which the plant roots, however, can make use of, extracting them from the humus in which they are held.

The actual proportions, according to our analyses, were:

For each lb. of Mineral nitrogen 0.47 lb. available plus 0.5 lb. unavailable nitrogen, 0.97 lb. *total* nitrogen in the B. D. mixture.

For each lb. of Mineral phosphate 0.77 lb. available phosphate (unavailable fraction unknown) in the B. D. mixture.

For each lb. of Mineral potassium 0.43 lb. available plus 0.5 lb. unavailable potassium, 0.93 lb. *total* potassium in the B. D. mixture.

For each 16 lbs. lime in the mineral fertilizer 10 lbs. lime in the organic mixture (not as lime added). No extra lime was used in either case.
The pH of the mineral fertilizer was 4.5. The pH of the organic mixture was 7.3.
The organic manure and compost were very well-rotted and earth-like.
The bacteria count of the manure was: aerobic 740 Million, anaerobic 20 Million; of the compost: aerobic 900 Million, no anaerobic (all counts per gram of sample). These counts are high. For comparison, the best, fertile, black soil of neutral reaction has a count of 500 Million.

The Soil Analysis Reveals (all figures of minerals in lbs./acre):

*Soil at the beginning of the experiment in spring* 1948

| | pH | K | Ca | Mg | NO3 | NH3 | P2O5 | % O.M. | Bact. Count Act. aerob. | Act. Az. | anaerob. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Blank ..... | 5.8 | 100 | tr | 20 | 5 | 0 | 75 | 3.07 | 130 | | 10 |
| *Soil at growing season of summer* 1948 (*without crops, but cultivated*) | | | | | | | | | | | |
| Min. ..... | 5.5 | 100 | tr | 20 | 235 | tr | 140 | 2.0 | .. | | .. |
| B. D. ..... | 6.5 | 100 | tr | 20 | 238 | 0 | 158 | 3.4 | .. | | .. |
| *Soil in fall* 1948 (*without crops, moist summer and fall*) | | | | | | | | | | | |
| Min. ..... | 5.5 | 150 | tr | 10 | 120 | 0 | 400 | 2.87 | 300 | 1 | .. |
| B. D. ..... | 6.4 | 120 | tr | 15 | 240 | 0 | 350 | 3.4 | 350 | | 50 |
| *Soil in spring* 1949 (*without crops, after a mild and moderately moist winter*) | | | | | | | | | | | |
| Blank ..... | 6.2 | tr | 0 | 15 | 2 | tr | 90 | 2.0 | 80 | 60 | 20 |
| Min. ..... | 6.2 | tr | 0 | tr | 2.5 | tr | 100 | 2.15 | 280 | 110 | .. |
| B. D. ..... | 6.2 | 105 | 0 | 15 | 4 | tr | 30 | 2.27 | 110 | 50 | 10 |
| *Soil in fall* 1949 (*without crops, after extremely dry summer and fall*) | | | | | | | | | | | |
| Min. ..... | 5.0 | 170 | 0 | 4 | 4 | tr | 175 | 2.97 | | | |
| B. D. ..... | 6.0 | 160 | 200 | 6 | 20 | 1 | 160 | 3.4 | | | |

These are the soils which had been left without crops, except a cover crop of rye during the winter of 48/49. This cover crop had a beneficial effect upon the acidity of the Min. soil. The availability of *potassium* increased during the moist summer and fall of 48, but declined during the mild, wet winter of 48/49 in the case of Blank and Min. While in the case of B.D., it was fairly well able to hold its own. Towards the fall of 1949 a complete recovery in both the Min. and B.D. cases was observed. All the soils were low and remained low in available *calcium*. It is remarkable however, that the B.D. and Blank soils did not show an increase of acidity, but remained about as they were—even without extra liming. The Min. soil increased in acidity again, after the winter recovery.
The *magnesium* content declined steadily in all cases. We advise those who use B.D. compost to add dolomite, or any other limestone which contains magnesium, to the compost pile, instead of straight limestone. The magnesium deficiencies of most Eastern soils are quite remarkable and require special attention.
The *nitrogen* content increased considerably in all the soils with treatment, in the spring of 48. The moist weather conditions of the summer of 48 were favorable for bacteria growth in the case of the B.D. soil, therefore, no nitrogen losses were observed there during that time. In the Min. soil nitrates dropped to about one half. The mild, moist winter of 48/49 reduced the available nitrates very sharply, somewhat less in the B.D. area. The hot and

extremely dry summer of 49 helped very little to build up nitrate reserves in the uncovered soils. The B.D. soil, however, had a slight edge on the Min. soil, with 20 lbs. nitrates/acre in contrast to the 4 lbs./acre in the latter. There was a very marked increase in available *phosphates* during the favorable weather conditions of the summer of 48. These declined considerably during the unfavorable weather in the winter of 48/49, and recovered to a moderate degree during the adverse summer of 49. In the case of both the B.D. and the Min., the phosphates and potassium, and the B.D. nitrates as well, were better than in the original soil at the beginning of the experiment. One certainly cannot say that the B.D. treatment depletes the soil of its minerals.

The important observation made so far is, that one and the same soil varies in its available minerals throughout the year and seasons, and that soil tests cannot be compared unless the time of sampling is taken into consideration. From these tables, it is also evident that the B.D. treatment favors the maintenance of organic matter and low acidity.

The whole complex is quite different in relation to crops grown on these soils. Therefore, we shall report on the tests of soil samples taken right under the respective plants in their root areas. Here, besides the influence of the season, the year, and the weather, specific effects of the respective crops upon the availability of minerals can also be observed.

In our experiment, we proceeded in the following way, in 1949. The whole area had a winter cover crop of rye, which was spaded under on April 3rd and 4th. Seeds were saved from 1948 plantings, from both the Min. and B.D. The seeds deriving from a soil were sown in this soil again, i.e. Min. seeds in Min. soil, and B.D. seeds in B.D. soil. Tomatoes and peppers were sown in flats April 20th. It was observed that the B.D. seeds germinated better and developed a thicker root system and more fine hair roots, too. On account of a very wet spring, the soils were cultivated and received their applications of fertilizer and manure-compost only on May 14th. A partial crop rotation was introduced. The corn was planted in last year's bean beds, and vice versa. The peppers were set out in last year's beet area, the beets in the carrot area, the carrots in the beet area. The tomatoes were put in the same beds once more. B.D. preparation No. 500 was sprayed on the B.D. plots May 16th. (This was unusually late and it would have been better had this been done at the time of spading.) The tomatoes and peppers were transplanted June 4th. B.D. preparation No. 501 was sprayed on the plants June 25th. At this time it was observed that B.D. beans, corn, and carrots were ahead of the Min. plants of the same kind, all of which had been sown on the same day.

The following general observations were made:
The B.D. beans went on bearing long after the Min. beans. No dust was used against the Mexican Bean Beetle this season. A few finally turned up, but concentrated on the Min. beans. B.D. corn stood up better and yielded much more than the Min. The Min. corn was attacked by the corn borer this year; all the Min. stalks collapsed at once. The B.D. corn was not attacked. Neither the beets nor the carrots turned out well on either side.

That was probably because we did not mulch before the hot weather. It was thought that it might not be a fair test even if one mulched both sides, or only the B.D.

The tomatoes did well. The B.D. were better than the Min. The Min. tomatoes suffered from dry rot on the undersides of the fruit. The B.D. had very little of this. All plants were staked and trained to a single stem.

The Swiss chard produced quite a lot very late in the season after we got rain. The Min., at that time, shot ahead of the B.D., which had been doing better.

A rabbit which found a way into the garden, concentrated on the B.D. side before nibbling on the Min., until we were able to locate his point of entrance and block it up.

The spring soil samples were taken April 4, 1949. The fall samples were taken October 26, 1949 and analyzed at once. We had a late, mild autumn, and none of the plants had been touched by frost at that time. All bacteria counts were made on beef-agar-peptone plates, incubated at 20° C for 48 hrs. for aerobic bacteria; on Brewer plates with an Anaerobic Agar medium, at 29° C after 48 hrs. for anaerobic bacteria.

The table on page 6 presents some interesting information. First of all, it shows the beneficial value of the B. D. treatment as far as acidity and humus content are concerned. Without exception, the pH of the B. D. plots is nearer to neutral than that of the Min. plots. Without exception, the organic matter content of the B.D. plots is higher than in the Min. plots in 1949. With *one* exception (carrots), the bacteria counts of 1949 are higher in the B.D. plots than in the Min. In some cases the differences are quite remarkable. In general, higher figures are found in the second year than in the first. The organic matter figures of the second year show, in all cases to a certain extent, the destructive effect of a hot, dry summer. More organic matter is broken down under such conditions. The lesson we read from this is, that in hot, dry climates particular emphasis should be laid upon the conservation of organic matter by adequate crop rotations, mulching, etc.

Again we see wide variations in availability in the root areas of different crops. These figures should be studied carefully and with caution. As they stand, they might lead to erroneous conclusions. A high availability in one case may signify benefit to the plant; in another case it may only mean that just so much more is subject to washing out and finally to loss. Since acid conditions increase the chances for loss and are negative indications of the presence of absorbent, neutral, colloidal humus (besides being unfavorable to nitrogen fixing bacteria such as Azotobacter), the combination of a pH below 5.8 with high availability becomes a minus value as far as permanent soil fertility is concerned. This is particularly the case in fall when plant crops cannot make use of these available minerals. Here we see one of the functions of winter cover crops such as rye, winter vetch, and others.

The other side of the picture is, that with neutral or near neutral reactions (pH 6.0-7.4) a high humus content means preservation and absorption of minerals, and much bacterial activity, which in turn produces more humus.

## *pH AND AVAILABILITY OF MINERALS IN RELATIONSHIP TO CROPS*

(All Samples Taken In Fall After Harvest)

Minerals in lbs./acre. Bacteria counts in Millions per gram of sample.

| | | | | | | | | | Bact. Count | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | pH | K | Ca | Mg | NO3 | NH3 | P2O5 | O.M. % | aerob. | anaerob. | Azot-bact. |
| **Soil After Tomatoes** | | | | | | | | | | | |
| 1948 Min. | 5.9 | tr | 0 | 12.5 | 105 | 0 | 158 | 2.6 | 50 | 10 | .. |
| B. D. | 6.8 | tr | 0 | 15 | 26 | 0 | 150 | 5.8 | 100 | 70 | .. |
| 1949 Min. | 5.5 | 180 | tr | 2 | 8 | tr | 200 | 3.2 | 350 | 0 | 20 |
| B. D. | 6.0 | 140 | 200 | 4 | 16 | tr | 190 | 4.2 | 1200 | 70 | 80 |
| **Soil After Beans** | | | | | | | | | | | |
| 1948 Min. | 6.3 | 150 | tr | 15 | 100 | tr | 400 | 3.8 | .. | .. | .. |
| B. D. | 6.4 | 110 | tr | 17.5 | 80 | tr | 150 | 5.8 | 120 | 10 | .. |
| 1949 Min. | 5.0 | 180 | 200 | 3 | 120 | 5 | 190 | 2.6 | 620 | 20 | 10 |
| B. D. | 7.0 | 160 | 500 | 5 | 140 | tr | 150 | 3.6 | 3030 | 0 | 0 |
| **Soil After Corn** | | | | | | | | | | | |
| 1948 Min. | 5.8 | 90 | 90 | 20 | 120 | tr | 237 | 3.6 | 800 | 60 | .. |
| B. D. | 6.2 | 165 | 165 | 12.5 | 240 | tr | 103 | 3.55 | 360 | 0 | .. |
| 1949 Min. | 5.5 | 300 | 350 | 4 | 70 | 10 | 200 | 2.5 | 490 | 0 | 0 |
| B. D. | 7.0 | 220 | 350 | 8 | 40 | 5 | 180 | 3.2 | 720 | 30 | 120 |
| **Soil After Beets** | | | | | | | | | | | |
| 1948 Min. | 5.8 | 110 | 0 | 15 | 30 | tr | 325 | 4.05 | 30 | 0 | .. |
| B. D. | 6.2 | 100 | 0 | 15 | 144 | tr | 325 | 5.65 | 160 | 0 | .. |
| 1949 Min. | 5.5 | 210 | 100 | 5 | 6 | tr | 175 | 3.4 | 370 | 10 | 0 |
| B. D. | 6.0 | 200 | 100 | 4 | 30 | tr | 160 | 3.7 | 760 | 0 | 30 |
| **Soil After Carrots** | | | | | | | | | | | |
| 1948 Min. | 5.9 | 120 | 0 | 12 | 120 | tr | 400 | 4.1 | 70 | .. | .. |
| B. D. | 6.8 | 352 | tr | 19 | 90 | tr | 190 | 4.95 | 270 | .. | .. |
| 1949 Min. | 5.0 | 240 | 400 | 4 | 80 | 6 | 150 | 2.5 | 280 | 0 | 0 |
| B. D. | 7.0 | 260 | 500 | 4 | 24 | tr | 180 | 3.2 | 270 | 0 | 50 |
| **Soil After Peppers** | | | | | | | | | | | |
| 1948 Min. | 6.1 | 80 | | | 80 | | | 3.57 | .. | .. | .. |
| B. D. | 6.7 | 345 | | | 420 | | | 5.75 | .. | .. | .. |
| 1949 Min. | 5.0 | 300 | 100 | 4 | 100 | 40 | 200 | 3.4 | 270 | 20 | 0 |
| B. D. | 6.5 | 170 | 200 | 4 | 24 | 20 | 100 | 4.0 | 1300 | 20 | 40 |
| **Soil After S. Chard** | | | | | | | | | | | |
| 1949 Min. | 5.0 | 180 | 200 | 4 | 40 | 5 | 200 | 2.9 | 220 | 0 | 10 |
| B. D. | 7.0 | 270 | 100 | 5 | 24 | tr | 125 | 3.6 | 400 | 20 | 20 |

From our observations we would conclude that it would be well to use a cover crop of winter grain on these plots this year. Such a cover would find particularly favorable conditions as regards potassium where corn, peppers and carrots had been growing, in fact the soil even demands such a cover. It would also be good to give the tomato land and the beet soil a manure dressing in view of the nitrogen situation.

The available calcium content was very low everywhere in this garden. The dry summer mobilized more calcium from the "hidden" reserves than did the previous wet summer. It is interesting to note, however, that the low calcium content in the B.D. section did not hinder the maintenance of a low acidity. Evidently the neutral reaction of any soil is due to more factors than liming alone. This year, we started making separate counts of Azotobacter, and find them highest with B.D. soils and at near neutral reactions. Peculiarly enough the bean soils were an exception to this. Here, however, we note extremely high total counts. The B.D. beans had a large number of nitrogen nodules on their roots, many more than the Min. beans.

It was our intention to present vitamin assays of the crops this year. The laboratory now has a spectrophotometer for such analyses. Unfortunately, the equipment was set up too late to be of much use this year and we can report only a few tests for carotene (provitamin A). Young green leaves of equal size at the height of the growth of the respective plants were used. The results thus far obtained are:

*Carotene Content in Gammas Per Gram of Green Leaves*

| | *B.D.* ⇄ *Min.* | |
|---|---|---|
| Tomato | 35.10 | 47.25 |
| Bean | 13.50 | 56.25 |
| Beet | 5.4 | 18.9 |
| Corn | 54.0 | 91.25 |

These experiments will be continued in 1950. They were made possible by generous donations to the Bio-Dynamic Farming and Gardening Association for the Biochemical Research Laboratory. I wish to take this opportunity to express my gratitude to all those who have helped in this way. Acknowledgment is also made to the Threefold Farm for the use of their facilities, to Fred and Alice Heckel for taking care of the experimental garden, and to my laboratory staff, L. Berlin, M. Vibber, and E. Sabarth for their painstaking assistance in the analytical and microbiological work.

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## NATURE'S COMPOST

By HENRY I. BALDWIN

*The editors are proud to print this paper, by a nationally known figure in the field of forestry. Dr. Baldwin, Research Forester of the State of New Hampshire is an old friend who has written for* BIO-DYNAMICS in the past. *We know our readers will join us in the hope that he may find time to write for us again before too long.*

* * *

Nature reclothes the earth's barren places, and increases fertility of areas already covered with vegetation by compounding a humus layer, or

compost, year by year. That is, such a mantle increases in fertility and even in thickness where conditions favor this and disturbing influences do not interrupt the process; or consuming factors proceed at an equal or higher rate than accumulation; for there is about as active breaking down and dissipation of the humus riches as accumulation. Were this not so, plants, undisturbed by man, might become buried in their own detritus. Furthermore, many nutrients stored in plant remains can only become available during decay. Prehistoric forests, it is well known, laid down our valuable coal and oil deposits. They accumulated a humus of unprecedented richness and thickness, but it did little good to the plants of that era. Today peat accumulates in bogs and in some areas it has been utilized for fuel. But as we survey the widespread evidence of soil depletion, erosion, forest and range destruction caused by man's short-sightedness, the humus economy of upland soils which are utilized by man for growing agricultural and forest crops and for grazing animals is of critical importance.

The story of wasted natural resources, and the deterioration or destruction which has attended their exploitation has been ably told in recent books that should make all citizens conservation-conscious even if action comes slowly. The purpose of this paper is rather to trace some of the building up processes, to illustrate both how reclamation of soils and vegetation proceeds, and also how degradation and loss can be prevented.

*Succession—Built on Humus*

The ecologist uses the classical example of reclothing a bare rock surface with vegetation, and the progressive improvement of the capacity of the site to support plants until the ultimate type of forest or grassland permitted by the climate emerges. First lichens appear, and wherever cracks or protecting ledges favor some retention of moisture, mosses, then shrubs or herbs and finally trees obtain footholds. Dust, leaves, other forms of organic matter collect and a soil is formed, the activities of roots and microorganisms now being added to physical weathering and chemical decomposition of the rocks. Thus, we are told, occurred the advance of vegetation northward after the regression of the continental ice front at the end of epochs of glaciation. We can see the process today before Alaskan glaciers. But forest fires (largely man-caused in the East) have presented similar conditions for pioneer plant invasion. The mountain summits of Chocorua, Cardigan and Monadnock in New Hampshire once fully forested due to centuries of soil building following the last Ice Age, were completely denuded by forest fires over 100 years ago. The summits are still bare, it is true, but photographs taken at long intervals show startling increases in vegetation. Spruce forest is recapturing the areas from which the very soil was consumed and blown away. It has been able to do this only because the trees and the shrubs that preceded them added each year, or each decade, more to the soil than was taken away, that is by leaves and seeds blowing away, humus becoming oxidized by the sun, leaching, erosion, etc. Here are these spruces not only surviving but increasing only because they add more to the soil than is removed. Is not this the substance of all conserva-

tion? To maintain by replenishing losses, but also to build better, to put back more than is withdrawn.

*Conservation in Nature*

That forests progress by storing more compost than is consumed annually can be observed in many other less extreme conditions than in the pioneer tree communities mentioned. It seems appropriate to point out here that other organisms are naturally conservationists. Squirrels, mice and other rodents commonly store more winter food than they consume, and thus aid in the distribution of many heavy seeds and nuts. Beaver have, in times past, aided in flood control, and trapped fertile soil behind their dams, that otherwise would have been swept away.

*How Forests Accumulate Humus*

Forests produce immense quantities of leaves each year, and these together with lesser amounts of twigs, seeds and bud scales, etc. are returned to the soil, and not harvested and removed like agricultural crops. Furthermore the parts of a tree that are removed from the woods when trees are harvested, i. e. the lower part of the bole, have the lowest mineral content of any part of the tree by weight. The bark is an exception, but sometimes the bark is left behind in the woods, too. Thus it is possible to build up forest soils even when wood crops are harvested. Of course, any large reduction in the timber volume will reduce the amount of annual leaf fall as well.

The amount of leaves and litter deposited annually by good stands of beech, pine and spruce range from 3,000 to 2,000 lbs. per acre, dry weight. Hardwoods produce more compost material than conifers, and it usually contains twice as much mineral matter. On the other hand more nitrogen is returned to the soil under conifers than to that under hardwoods. Older forest produces more litter than young stands. The following data show the amounts in pounds per acre returned to the soil annually in Central New York forests:

| | Calcium | Magnesium | Potassium | Phosphorus | Nitrogen |
|---|---|---|---|---|---|
| Hardwoods | 65.6 | 9.2 | 13.5 | 3.3 | 16.6 |
| Conifers | 26.5 | 4.5 | 6.5 | 1.8 | 23.6 |

Once on the ground, litter in the deep woods remains pretty much where it fell and decomposes slowly into what we call humus. There is little wind movement to blow it around, and floods from brooks are localized. It is protected from direct sunlight to a large extent, and leaching of soluble substances by water percolating into the soil is not important. Much that enters the soil is absorbed by the tree roots and ultimately returned to the soil.

It is evident that conditions on the forest floor (shade, reduced temperature extremes, protection from wind and water) favor the protection and accumulation of large amounts of organic matter, containing as well considerable amounts of mineral elements essential for plant growth. However, these organic plant residues must be decomposed before the nutrients are of benefit to plants, and decomposition is necessary if the organic matter is to exert a favorable influence on the soil.

*How Decomposition Progresses in the Forest*

Details of the partially understood processes by which fresh leaves and twigs ultimately lose their identity and become black amorphous leaf mould or humus cannot be presented here. Physical agents like water, freezing and thawing and the pressure of winter's snow are matched by chemical action. Earthworms, small rodents and other biological agents play a part, but micro-organisms, both fungi and other forms, are probably the most important influences on decomposition. As anyone who has ever examined compost knows, some plant materials decompose more rapidly than others. Volatile products like carbon dioxide, that is given off to the air, and dissolved in soil water, disappear. Resistant materials remain, and to a considerable extent form the true humus. Some constituents like resins and tannins, or a high lignin content, tend to inhibit decomposition. Usually the richer the litter is in mineral nutrients, the more readily it decomposes. The presence of nitrogen promotes the decomposition of cellulose, for fungi require 1 part of nitrogen for every 30 to 50 parts of cellulose decomposed. Debris from young trees usually decomposes faster than litter from old trees. Good aeration, optimal moisture supply, adequate, but not excessive heat, and many other factors are required for the maximum rate of decomposition, and many a forest compost is far from perfect. Indeed the chief problem that faces foresters in managing forest soils is how to cut so as to obtain the optimal rate of decomposition and at the same time build up fertility in the soil.

*Control of the Rate of Decomposition of Litter*

The amount of organic matter lying on the forest floor varies with the species of tree, the climate and many other factors. So does the rate of depletion as outlined previously. In general it is a healthy condition for litter to disappear, i. e. decompose and become humus, as fast as it accumulates. Since it takes at least 3 years for the average litter fall to be so transformed, there should always be a cover of undecomposed material forming the top layer of the forest floor, and protecting the lower layers from drying out. The surface should be loose, not matted, and the underlying layers soft to the step.

To observe how decomposition proceeds, go out in a hardwood grove and remove the leaves on the forest floor one by one until they show signs of decay. You will find some completely reduced to skeletons, showing only the veins, others partly eaten by earthworms. Often a maple leaf will be found thus partly reduced, lying on top of a more resistant oak or beech leaf. Ash, aspen, basswood, alder and willow are most easily decomposed. They are the species that are richest in nutrients, and hence these leaves are the best soil improvers. Beech and oak leaves contain much silica and tannin respectively that retard decay.

Needles accumulate to a great depth under young pine plantations, when light and sunlight are excluded. When the stand matures more rapid decomposition may reduce the thickness as does any thinning. One good way to tell whether trees need thinning out is to examine the litter. If

several inches of undecomposed needles cover the ground due to branches dying faster than they are being formed, it is a pretty sure sign that something must be done to give the trees more growing space. Opening up the stand will speed decomposition and give the trees additional nutrients.

One of the chief causes of slow decomposition is lack of moisture. This operates indirectly by retarding the activity of earthworms and micro-organisms. One cannot go out and water the forest floor to correct such a condition, so let us examine the causes. First the trees act like umbrellas and intercept some rain and snowfall, so that it evaporates on the crowns and trunks and fails to reach the soil. This may amount to 25% of the total precipitation. Then the tree roots literally desiccate the upper layers of the soil in their search after moisture. As a result fungi and other transformers of the litter are held up by drought. What can be done to correct this? Remove some of the offending roots and crowns! This takes the form of light and frequent thinning. Of course the roots are not removed, but they are rendered inactive when the tree is cut. Thereafter they serve a very useful purpose in the compost scheme. They too decay in time and leave little cylinders of organic matter in the mineral soil that improve water percolation and permeability. The branches and tree tops should be scattered as uniformly as possible in the openings created by the thinning and left to rot. They add a valuable mulch and protect the soil from the sun. If thinnings are light, the slash will not be thick enough to be objectionable. It should never be burned.

Clear cutting a forest results in a rapid disappearance of nearly all this valuable forest floor. Take note of the character and amount of the litter in a heavy stand of timber, and then visit the same spot two or three years after it has been cut. Often no trace of the litter will be found. Where did it go? Decomposition has proceeded too rapidly. Much has been oxidized just as completely as if a fire had consumed it. Quantities of nitrogen have been released above the requirements of the tree seedlings (if any remain) and some of this is being dissipated in a wild growth of raspberries and weeds. Some of the floor may have blown or washed away. Eventually a new forest will become established, and litter accumulation will replace losses, but for many years humus depletion will go on.

If after cutting, the land had been pastured, or ploughed and crops harvested, the rate of depletion would have been still greater. Fire is the greatest consumer of all. Over too much of our land bare rock or a thin soil over rock remain where once stately forest giants grew. The forest will some day reclothe these areas, too, but the progress of advancing succession is slow, that of retrogression swift and disastrous.

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## FAITH HOMESTEAD

*A 20th Century Venture in Creative Living*

HELEN PHILBRICK

*Mrs. Philbrick, author of the following lively and interesting experience report for the readers of* BIO-DYNAMICS, *is the wife of a Protestant*

*Episcopal Clergyman who is devoting his ministry to rural church work. The Rev. and Mrs. Philbrick lived and worked for 9 years at Duxbury, Mass., interweaving parish work with the development of a subsistence homestead. These friends have recently been called to the National Town-Country Church Institute of the Protestant Episcopal Church, at Roanridge, Parkville, Missouri. There they will help in the training of young theological students (with the advantage of having no great age gap between them and their "pupils") who intend to go into the rural ministry.*

*Much of this teaching will be by example, in connection with their development, at the Institute, of a model subsistence homestead of their own. The editors of* BIO-DYNAMICS *understand that officially this is the Rev. Mr. Philbrick's job, but feel sure that his superiors, who know of the joint work of these two enthusiasts for rural life, will not object to our reference to "their" activity.*

In 1942 there was practically nothing written about living on the land on a small scale. There was one Government Bulletin issued from Washington, D. C., entitled *Planning a Subsistence Homestead,* but it was also entitled *Farmers' Bulletin No. 1733,* and we had not the temerity to ask for it on the coast of Massachusetts where the largest "farm" might have been the cornfield where Squanto taught the pilgrims how to plant corn.

It was some literature from a hardware store on "Victory Gardens" that started it all. During the war, when food was hard to get, we planted a small Victory Garden in an unlikely piece of ground—with a noble hedge of Swiss Chard as a border. The chard grew waist high and we felt duty bound—in the name of patriotism—to eat our way through that barrier before the end of the season (and Swiss Chard is remarkably resistant to frost). Our turnips that year grew as big as our heads—but they were hollow. Somewhere between the turnips and the chard we gathered enough vegetables for Summer use and a few for canning. The Victory Garden had planted an idea along with the seeds.

The following Spring a series of circumstances made it possible for us to buy an old farmhouse and five acres of land, mostly woodlot, on the edge of the pinewoods about two miles from the town of Duxbury, Mass. In April of 1943 there was a conference at Northfield, Mass., at which we heard for the first time of a man named Ed Robinson who was publicizing an idea called *A Little Land, a Lot of Living.* This conference was a memorable occasion of great importance in the lives of the Philbrick's because it was the first time we had ever heard of Bio-Dynamics. Some Quaker friends, whose brother was actually creating a "Subsistence Homestead" told us just enough about Bio-Dynamics to make us send for the book *Bio-Dynamic Farming and Gardening.* It seemed interesting at the time, but far more technical than anything we would ever be able to try. The book was laid aside until such time as we could stay away from it no longer.

The special value of that rural conference was that it showed us that there were many people all over New England who were living on small homesteads and raising as much as they were able, to supply their own needs.

It gave us courage and we went to work in earnest, always with a critical eye to the direct relation of each new project to the people to whom we were ministering. It was not long before we discovered that many other people were having the same flight of ideas. Dozens of our contemporaries were planting Victory Gardens and had discovered the good taste of fresh vegetables. Many of our neighbors liked fresh eggs and were caring for a dozen hens in their own backyards. It was stimulating and profitable to talk over our poultry problems and experiences with parishioners in the middle of a parish call. People came for information about starting a poultry flock, for instance, and we were encouraged to venture further among the creative possibilities of a little place in the country.

The first large scale immigrants were Lizzie and Aggie, two milk goats who insisted that we subscribe to several goat magazines and attend frequent meetings of local "Goat Clubs." Before long we found that a meeting of a goat club was an assembly of many kindred spirits. The fellowship was warm and sincere and friendships were nurtured which have never flagged.

Having two milk goats to feed created a need for food to be grown on the place. The vegetable garden was still in an experimental state as far as our experience was concerned—except for Swiss Chard. But our education was rapidly being extended.

It was a fortunate coincidence that at the time when the family budget was too thin for investing in commercial fertilizers, we at least had goat and poultry manure. Another link in the chain of coincidence was that at the time a copy of *Organic Gardening* fell into our willing hands. We built a New Zealand box to compost all of the excess vegetation, garbage, and manures from the different barns. (By this time also a hurricane had blown over enough acres of pine woods to furnish us with lumber to build a goat barn and several henhouses.—It's an ill wind . . . and this wind blew us plenty of good, in disguise!)

As one of our friends who tends to glamorize things, put it, everything on Faith Homestead makes it possible to raise something else. He actually had sensed a very important inter-relationship and interdependence, however. The compost improved the land which grew the hay to feed the goats, who in turn contributed again to the compost—with a daily milk supply in the bargain.

Looking back we may tend to idealize in retrospect. The years lived at Faith Homestead were characterized by a constant sense of urgency. There was so much to do, and we had no power tools to lighten the labor. The salient fact is that by hiring a tractor to plow once or twice a year, and by using compost, we brought the soil into a condition of tilth where it was entirely possible to cultivate with a hoe and a crile. By the end of the day we were exhausted, naturally—with parish activities plus the homestead work. But it was a healthy tiredness. We never had colds. We had plenty of good food all year 'round. We knew that whatever we did raise was grown without resort to mineral fertilizers which would have been very detrimental to that sandy soil. We were never hungry—and the food bill

at the Co-op for several years averaged less than $20.00 a month for such staples as coffee, salad oil, spices, peanut butter, and some sugar. Later we had honey from the bees. We used molasses, and all of our unbleached white flour was augmented by whole grain ground in the coffee grinder. We never tolerated a loaf of "store-boughten" bread to come within a stone's throw of the place—without throwing the stone.

The sheep were generous with their wool and have provided us with many batts for comforters—enough to share with some of our friends. And at the end of five years' happy companionship the sheep went to live with friends who paid us the $50.00 that they had cost us in the beginning.

Both goats and hens went to live with other friends to enrich their homesteads, and, we hope, to continue to make their way of living full of nourishment and worthwhile experience. One family to which some of these animals went consists of two parents and five children who are all enthusiastic about the increase in benefits incurred by moving to the country. It was our privilege to work along with these folks in their move from the city and to help them to get established in the country. And we are very proud of their adjustment to the exigencies of country living.

Looking back, it is possible to evaluate the angora rabbits as perhaps the most charming but not the most productive creatures on the farm. They served a term of usefulness during the war when their wool was really valuable and we did receive checks for as much as twenty dollars for the wool from fifteen to twenty rabbits. This, incidentally, was almost our only cash crop. A point which is often misunderstood is that the productive homestead is a way of living, not a system for making money on everything raised thereon. We tried to demonstrate that it is possible to raise enough to improve one's standard of living without having to sell for cash.

The rabbits attracted many visitors, which gave us a chance to sell ideas about the small productive home to all sorts and conditions of men. Especially at the close of the war there were many ex-GI's who came to talk over the prospects of making angora rabbits a home industry. We tried to help by introducing the men to the rabbits and vice versa, and by providing all the literature that was available in magazines and government bulletins and in specialized publications on rabbits and small stock.

Pigeons and ducks and geese came and went with gracious informality. There was always the prospect that if we were very hungry, we could catch a meal on the wing, as it were. Ducks' eggs were delicious—but we learned by sad experience that the hen's egg is the only egg that can be "beaten" to a still white froth. The duck's egg-white will only turn into a sulky limp liquid, with not even a suggestion of foam. Don't try it! Indian Runner Ducks lay eggs like mad—everywhere. They would fill a nest and start a second layer. They would sit patiently for 28 days and emerge with families of delightful little ducklings, and many are the laughs we have had over the duck comedians in our farm family.

The pigeons still live at Faith Homestead. They had been largely self-supporting most of the time anyway, except for such grain as they could

"snitch" from the hens. They hardly care whether human beings are there or not, but they seem to give us a friendly welcome when we go back to visit.

We found that raising a pig is not economical when you have to pay in cash for the feed. But we know also of an untried bulletin entitled *How to Raise a Pig Without Buying Feed* (Ed Robinson). And we look forward to having a pig and a feed-growing department in this new location —only here we will have the added incentive of teaching the theological students who hope to work in rural parishes some of the fine points of raising a pig in the small productive home. Imagine how welcome a parson might be who could help teach his parishioners a way to provide their own meat supply at no increased cost to themselves!

It is difficult to evaluate the accomplishments of the past. Either we glorify them because we have forgotten the grim aspects, or we try to forget events because they were just too loaded with failure. Sometimes we had to summon all the gaiety at our command to "laugh off" some especially dismal failure. In spite of everything, however, we continue to proclaim that a small productive homestead is the complete answer to 1949's tendency to over-specialize. Without losing sight of the one main project which was the successful steering of a productive homestead, we have learned a little about composting (both Sir Albert Howard and Bio-Dynamic), raising vegetables and flowers, earthworms, organic gardening as a system and as a philosophy, fruit trees and strawberries (although the crop was almost not-existent) house planning and building, wall papering, wiring, but especially plumbing. We have had a try at canning anything that could be put into a tin can—even goat's milk—and some lard which is still fresh and sweet after three years. At various times we have made butter and cheese which bade fair to overshadow our respective careers! Dressmaking and tailoring are part of the year's routine, and even as I write I am wearing cloth woven on the loom several years ago and which still shows no signs of wear, because it "is all wool and a yard wide."

Far from being a catalogue of accomplishments, such a list is merely the homesteader's sphere of interests. One thing leads to another, and living is infinitely enriched by an opportunity and incentive to be creative. Instead of taking pride in what we have learned already, we must constantly be reaching out to learn more about the wonders in the world around us, and about the inter-relatedness of the vegetable, animal and mineral kingdoms, and man's place in the midst.

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## THE USE OF LIME IN BIO-DYNAMIC COMPOSTING

Liming or not liming? And if we lime, then what kind of lime? These, and questions like them come up with rhythmic frequency for answers from the one engaged in any kind of B. D. work. They have been treated in the past in this magazine. But it seemed time to get a re-statement of scientific principles and practice. In fact, one of our readers was

faced with the problem—in terms of a good neighbor who said, in effect, "My book says you should never lime any kind of compost." The question was put up to Dr. Pfeiffer, and here is what he said:

1. Hydrated lime is calcium hydroxide and has an alkaline reaction.

2. An alkaline reaction frees ammonia in manure and in rotted or partially rotted compost. Therefore, hydrated lime, or any other hydroxide, does not belong in manure or in such compost.

3. Burned limestone (unslaked lime) is a mixture, containing calcium oxide. Calcium oxide, in touch with water—or even air moisture—changes into the hydroxide. Therefore burned limestone does not belong in manure and rotted or partially rotted compost.

4. Limestone usually called "lime" (ground agricultural limestone) is calcium carbonate. Calcium carbonate, $CaCO_3$, is very slightly soluble in water, although soluble in carbon dioxide-containing water and in acids. It does not free ammonia in manure or rotted and half-rotted compost, and therefore can be used in these.

5. On fresh compost material we use unslaked lime or hydroxide (i.e. the oxide form of calcium, that changes to a hydroxide) because we want to break down the raw organic matter. In this process the hydroxide is gradually transformed into the carbonate. No hydroxide should be used on old rotted compost or on manure.

6. The trouble comes about because people call everything "lime," not making a distinction between the different types of "lime." I have frequently encountered farmers who even called sandstone or conglomerate "lime" because the prevalent rock used to be called lime. This is somewhat similar to the use of the word "corn." Corn in the U. S. A. means maize, in Scotland rye, in Southern England and on the Continent wheat, and in the Alpine Mountains spelt.

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## D. H. I. A. TEST AT THREEFOLD FARM

ERNEST DANIEL

*This little story is highly recommended for your study. The facts reported are interesting evidence for the value of particular methods of land treatment. This B. D. farmer's modest statement speaks for itself.*

* * *

At the end of March, 1949, the Northeast Dairy Herd Improvement Association was organized by some 15 dairy farmers of Bergen, Passaic and Essex Counties in New Jersey and Rockland County, N. Y., under the Bergen County Extension Service. Co-operating agencies are Rutgers University (the State University of New Jersey), the U. S. Department of Agriculture, and the Bergen County Board of Chosen Freeholders. The work of this association is to determine by actual tests the production of milk and butterfat of each cow, and the cost of feed per production unit. With the aid of such records, it is hoped to improve a herd's production through better feeding methods and breeding.

Since we at Threefold retail Grade A Raw milk, we had always checked daily the production of our herd. And the New York State Department of Agriculture and Markets tests our milk for butterfat, besides making bacteria counts and customary health tests for brucellosis, T. B. and other diseases. We had, however, no way of comparing our production with other herds in the vicinity. Our becoming a member of the D. H. I. A. brought a few interesting facts to light.

The Association Superintendent tests an average of 500 cows a month, the 15 participating herds varying in number from 8 to 118 cows. At Threefold, we milk 13. Due to seasonal fluctuations in our milk sales, we have to concentrate on the highest production during the Summer months, and therefore the figures given here, since they are for the period of April-October, are not entirely conclusive.

*D. H. I. A. Report for October,* 1949

| | |
|---|---|
| Estimated highest feed cost per 100 lbs. of milk ..... | $5.63 |
| Estimated lowest feed cost per 100 lbs. of milk ..... | 1.79 |
| Our feed cost per 100 lbs. of milk ..... | 1.85 |

During this period, of October, our herd was Honor Herd in Fat Production, with an average per cow of 37.1 lbs. of fat and 842 lbs. of milk. This milk tested 4.4% butterfat.

In the September report, our herd made the highest average pounds of butterfat, with 38.9 per cow, and was second highest in milk production, with 900 lbs. per cow. The average for 539 cows in that September test period was 693 lbs. of milk and 27 lbs. of fat per cow.

The reported August production average for 533 cows was 710 lbs. of milk and 27.4 lbs. fat per cow. Our cows averaged 872 lbs. milk and 34 lbs. fat in August. Individual cows, like "Mary," produced up to 1,953 lbs. milk during this August period, with 68.3 lbs. fat. This put our herd very near the top.

During those months, when pasture conditions here in the East were the worst in a good many years, all our cows had, besides pasture, 1 lb. of a 12-14% Fitting Ration to each 8 lbs. of milk produced. I saw a report recently, on a New England pasture program, and it seems the participants in that program did well. However, all applied to their pastures "an average of 1,443 lbs. of a—14.14 or—19.19 (phosphate and potash) fertilizer per animal unit, and 2.7 acres of pasture, average, were needed per unit." In addition, 1 lb. grain to 8 lbs. milk (lowest) up to 1 lb. grain to 4 lbs. milk (highest), was fed, and some contestants irrigated their grazing land.

We had, here at Threefold, for 13 cows and 7 young stock, 30 acres accessible for pasturing. Of this, about 9 acres were cut for hay once, then pastured; and nearly 3 acres of Spring Wheat were harvested for grain and then a ladino and orchard grass mixture, growing in the stubble, was pastured. Also, of the 30 acres, about 6 acres were in Jap. millet and soybeans for pasture.

This whole acreage, with B.D. treatment, carried these 20 animals from April 15 to October 17th—no additional hay fed—and produced, according to the D. H. I. A. report, 100 lbs. of milk for an average cost of $1.85 (including the supplemental grain mentioned above). There was no irrigation, and this is where the B. D. Method proves its worth—regardless of dry, or also wet, weather conditions, growth is constant.

We also try to let our animals be the judge when the palatability of the feed is concerned. When offered, side by side, bought alfalfa hay at $61 per ton, and home grown soybean-millet hay estimated to cost $25.00 to $35.00 per ton, they cleaned up the soybean-millet and left the alfalfa. This is not imagination on our part, because other farmers have told me of their very same experiences. Their own cows had the same sort of reactions to this kind of blue-green alfalfa.

The report of the D. H. I. A. for a short period does not give us a conclusive picture, but several years of testing should, we think, prove to the critical—as the adverse weather conditions this year again proved the B. D. to us—that our soils to a great extent determine the cost of feed per pounds of milk produced.

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## A FARMER'S HOLIDAY

ERNEST DANIEL

*Mr. Daniel whose dairy herd report you have just read, does the farming at Threefold Farm, Spring Valley, N. Y., with the help of Howland Vibber. Mr. Daniel recently had a chance for a brief, well-earned vacation, most of which he spent in visiting other farms. We enjoyed so much what he had to say, when he came back, that we asked him to write it for* BIO-DYNAMICS *along with his cow story. We think that you will enjoy it too, besides getting some useful ideas.*

* * *

About the middle of October, when the most pressing work here on the farm was done, it seemed a good time to take a few days to see what goes on in other parts of our great country and to combine this "getting away" with a vacation. And *I found it to be a vacation* as I understand its meaning. Dr. Pfeiffer once mentioned that it gives us a better view of our own activity and farm, if we look at it from a distance.

Without definite plans, we headed for Pennsylvania to visit the Fetzers at New Hope. They had expected a visit from us for years. My wife, Joan, wanted to see the Quaker establishment at Pendle Hill, spent the first few days doing just that, and found the activity in that community most interesting. My arrival at the Fetzers' is something I will always remember. Everyone greeted me as if the long-lost son had finally returned, and I felt at home from the start to the last day.

On the second day there, with the schnauzer "Princess" as company, (she was excited and busy giving rabbits, squirrels and what not, a scare), I took a good look around the 100 acre farm. What I saw there at that time of year included a stand of clover which in other sections would have

been a fine Spring pasture. Winter wheat and barley, though they had been seeded only a short while, looked very well. Eight acres of corn stood ready to be husked at the end of that week.

It interested me to see Ernest Fetzer at work. He started, that week, to build a corn crib, 25 by 5 by 8, with the help of Bob, his right hand and helper, and Harry, 85 years of age, an old-timer and carpenter. By Friday they had the crib, (and a drive-through shed roof, 25 by 12 feet, connected to a machine shed), completed. And on Sunday the corn was stored. This crib, complete, Ernest Fetzer built at a cost of about $100, using lumber from his own wood lot and buying only the metal roof. And the building is there to stand.

A story of how they build at that farm: A year or so ago Ernest and Harry put up a chicken house. Then last Summer a son of one of the guests whom the Fetzers board decided to try out his father's new car, and of course landed against the corner of the coop! Well, the front end of the auto crumpled, which I did not see, but Bob said it looked "pitiful." However, the chicken house shows not a sign of the encounter.

The next thing which interested me greatly was the husking. Saturday, some fifty people—all friends of the Fetzers—with families, children and all, appeared and started to husk in the 8 acre field. Some loaded the corn on wagons, and a round 8 hours saw it all in the crib. A clean job at that, which a mechanical picker could not have done. The crowd had a good time in the field, and as good a time at the table, and certainly also in the evening at the square dance and singing. Work, it proves, can be a great pleasure.

Near the Fetzer farm is another B. D. farm which was started only about 2 years ago but is a shining example of what good planning, excellent farming and real business ability can accomplish. It is the farm of Walter Stuber, managed by Morgan Wolfram. Morgan showed us the 190 acres of farmland—and it is a farmer's delight. We were most impressed by an alfalfa field which, Morgan says, the farmers in that section had told him "could not be grown." This 11 acre stand had been cut four times—and remember the dry Summer we had—and there was again a good growth. Another large field was in new alfalfa, seeded in August, and looked as fine as one could wish for. Practically the whole acreage has been subsoiled twice, as Morgan told us.

Later, when we saw our friend Walter Stuber, it was something to hear him say that they were breaking even on "Golden Acres Farm" this year. Also, he had expected, in order to increase the milking herd to 80 head, that he would have to buy more land. But he finds with this year's harvest from the present acreage, that there will be sufficient feed to support this enlarged herd. There is a considerable amount invested in the farm, to judge by the modern barn and fine herd of Guernseys. Yet with a good soil (and Pennsylvania still has some of the best) and the use of B. D. and the expert advice which Dr. Pfeiffer gives, the place shows that good farm practice and business ability can make farming economically sound.

As to what farming does for health, the individual experiences this himself. In this connection Morgan mentioned potatoes he had bought from a young farmer who works organically, and claimed they were the best he ever tasted. This had to be investigated, of course, and so we stopped at Bally, Pa., to see John Moyer, and had a talk with him. Unfortunately he was sold out and we could not try his potatoes, but he does his farming in a unique way. For 6 years he has not used a plow, but disks only. At the beginning it took him at least six times to work the soil loose enough for seeding, and now it is three diskings to do the necessary work. His system is to fallow one third of the acreage. At first he tried using ladino for a cover, but he has since found soy beans to be by far the best. These are disked in.

John has a few hundred chickens, but no other stock. His success is therefore due to the cover crops, and leaving all the organic matter mixed in the top six inches. A cover of Winter wheat, and the elasticity of the soil, gave us something to think about.

The story a commercial potato grower gave us, throws some light on the results achieved by John Moyer's methods. A 500-600 bushel crop is taken to market by the commercial grower. There the buyer inspects the bags for wet spots. The bags showing these are separated. For the apparently good ones, the grower gets perhaps $1.50 per hundred pounds, and 70c to 80c for the culls showing wet spots. This is because these spots are caused by rotting, *and this immediately after harvest.* John Moyer estimated that his yield in the "truck patch," with compost, chicken manure, etc., added to the plant material made available by his method, would be about 600 bushels per acre. His field crop was not as good, since the particular field had not been worked long enough, but he is sold out at a much better price than the other growers receive. And anybody could figure the difference in the cost of production with his method and with the other. We were very glad to have met him, and hope to see more of him, for our mutual benefit.

Once we had come into the vicinity of Emmaus, we of course wanted to stop at the Organic Gardening demonstration. It seemed that some of the Herefords and sheep had escaped that day, and everybody was out hunting for them. Also, our time was short. So I hope we are forgiven for having had a look around the lovely place without anybody being there. I can't say much as to the composts, because the materials used in a number of experiments were listed in abbreviations; but it was the stone mulch around trees and in the vegetable gardens which caught our eyes. The vegetables were enormous (no weeds) and the life and moisture under the stones is amazing. Although tempted, I restrained myself from pulling up one of the carrots to have a taste. The corncob mulch around the hazelnuts also was something new, and a report on its effectiveness will certainly be interesting. This experimental farm gave one the feeling of its being a healthy organism, and the well kept grounds and the neat appearance of

the stone mulch around vegetables and trees appeals very much to the garden lover.

Of course there is in Pennsylvania more than just what attracts a farmer's eyes. The famous Pennsylvania Dutch dinners had to be given some attention on this trip, and one place to find a typical one is at the hotel in Shartlesville. Such a treat is called the "Seven Sweets and Seven Sours." The table is loaded during meal time and stays so until the last diner has left. Most, or at least some, do not leave with the most comfortable feeling—but for this, they have nobody to blame but themselves. We, that is Marie and Ernest Fetzer and Joan and I, also experienced the hospitality of the Eastern Pennsylvania Dutch settlers at Schnecksville with the Hans Mahle's. And we had a much too short visit with our good friend Josephine Snyder, well-known and remembered from her attendance at the B. D. conferences. Perhaps it arises out of mutual interests, but really it is more the generations-old, and fine, custom of "visiting" that gives these contacts a festive feeling.

Toward the end we planned a visit to the Pocono Mountains to say hello to Helmut Sieber and enjoy his paintings. At Buckhill Falls Inn the traveling ended for a short time and gave us a chance to look back at the impressions of the previous days. From this Quaker-established Inn, but perhaps even more from its setting, there streams forth a peace and a restful atmosphere. There Nature, undisturbed although cared for, gives us an example of its beauty and near-perfect balance due to the lack of interference by man.

We looked back, in our minds, at the drive along the crest of a ridge the day before. There was the valley along one side of the road, with its well-kept farms, white buildings and fields but—a danger signal for the future—without trees or protective fences and hedges. In the other valley, on the opposite side of the same road, were desolate-looking homesteads and abandoned land grown back to weeds and brush—both these valleys, as far as we could determine, lying in the same fertile section. In the days before that there had been the farms worked organically by conscientious farmers realizing a duty to mankind and nature.

Still, the mountainous, naturally-balanced beauty seemed to reveal a further secret. It grew out of the contrast of this untouched forest landscape with the farmlands. For when we think of how much even the best organic farmer takes from the land he crops heavily year after year, we realize that no matter how much he returns there is a certain amount "used up" in human and animal nutrition. Then our thoughts naturally turn to the B. D. preparations given by Rudolf Steiner, the value of which has been proven scientifically by Dr. Pfeiffer *, and from the economic and ethical side by many farmers and gardeners.

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* See, *The Bio-Dynamic Method, what it is and what it is not,* by E. Pfeiffer, BIO-DYNAMICS, Summer, 1948.

## IMPORTANT ANNOUNCEMENT REGARDING THE B. D. COMPOST STARTER

The B. D. COMPOST STARTER has been developed for use with grinding machines and for rapid decomposition of garbage, weeds, leaves, municipal and industrial wastes. Pilot experiments, using the STARTER with large quantities of materials, have shown that it is possible to decompose such wastes in 10 to 20 days at outside temperatures ranging from 50 to 95 degrees Fahrenheit, if the original raw material is ground as fine as possible. It is not necessary to turn such heaps. Many different kinds of raw material can be mixed while grinding.

For small garden and home use and when high speed is not too essential, we recommend the Keston Organic Shredder (Organic Implements & Products Co., P. O. Haddon Heights, N. J.). For larger commercial use, to work up municipal and industrial wastes and bulky materials, with a production of 20 to 100 tons or more per day, we recommend the Mitts & Merrill (Saginaw, Mich.) Red Band Hog, Model A, which has a capacity of 2 tons per hour. This company also puts out a larger model on request. The Keston Organic Shredder operates on a ½ HP electric motor, or on a 1½ HP gasoline motor. The Mitts & Merrill Red Band Hog, Model A requires about 30 HP. A grinder with a capacity of 100 tons per day requires 75 HP.

The B. D. COMPOST STARTER is described below. Please note that it is to be used *only for machine composting*. The bio-dynamic preparations 502 to 507 are to be used as usual for the treatment of garden and farm compost and manure heaps without mechanical grinding. No change has been made in these practices. So place your orders for the bio-dynamic preparations as before.

The B. D. COMPOST STARTER will be available by about March 1950. Please allow for 2 weeks delivery time on small orders, 4 weeks on large orders. For shipment outside of the Japanese Beetle Zone, a special, certified starter will be ready by March 1950. Prices will be announced later on. The B. D. COMPOST STARTER will be shipped in Polythene bags which keep it moist and alive for two to three months.

Larger municipal or industrial projects and commercial machine composting plants can be worked out and negotiated on a consulting and license basis (i. e. on contract). Successful machine composting requires technical and biological knowledge of the processes involved.

Another type of compost starter is needed for composting specialized materials such as sawdust, wood shavings, bagasse, etc. This is still in course of development.

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## MAKE YOUR OWN COMPOST THE FAST MACHINE WAY WITH THE B. D. COMPOST STARTER

(Formula Originated By E. E. Pfeiffer)

### WHAT THE B. D. COMPOST STARTER IS

A selected and carefully prepared group of humus-forming bacteria carried on a natural medium enriched with growth hormones and enzymes.

(Hormones are living substances which stimulate life processes. Enzymes, also alive, help digestion.)

## WHAT THE B. D. COMPOST STARTER DOES

It hastens the breaking down of all kinds of organic matter, garbage, organic wastes, plant trash, weeds, manure, old hay, and straw.

It inoculates the broken-down organic matter with bacteria which are signposts for a fertile humus. These bacteria digest organic matter and turn it into a stable humus.

## HOW DOES THE B. D. COMPOST STARTER WORK?

We can get the clearest picture of this by looking at what happens to the food we eat. First we chew it. As we chew it, enzymes are mixed with the food and these perform a kind of pre-digestion. The final digestion is done with the aid of other enzymes and bacteria.

The best fermentation of compost, too, can be achieved by cutting or grinding the raw material to be composted as fine as possible. The STARTER is added while the grinding or chopping is going on, and thoroughly mixed with the ground-up material. The finer the grind, the better the mixture, the quicker the result.

This B. D. COMPOST STARTER has been developed specifically for machine-ground compost.

To get the quickest results, we recommend adding the STARTER to the material as it is being fed into the grinder. The STARTER can be sprinkled over by hand, or by a mechanical shaker or feeder of some sort while grinding.

However, it may also be sprinkled over the ground-up material. The mix is less even, in this case, and it will take a little longer for the heap to ferment.

The end result, in either case, will be a black-brown humus.

## DO NOT OVERLOOK THESE POINTS!

Ideal Conditions for Machine Composting:

1. *The Mixture*:

Use 50-60% Raw Organic Matter (garbage, weeds, plant trash, grass cuttings, old hay, etc.)
25-20% Earth (topsoil, ditch or pond scrapings).
25-20% Old compost, old manure, or sludge.

Mix these in the proper proportions while grinding. Add one 2 lb. Unit of B. D. STARTER for each ton or cubic yard of raw material.

The basic principle is, that the greater the number of different ingredients, and the better they are mixed, the quicker the fermentation will be.

For garden crops, and when the compost is to be used on acid soils, add 5 lbs. of ground limestone or dolomite per ton of material. This is also done during the grinding.

For acid-loving flowers and crops (azaleas, rhododendrons, potatoes) do *not* add lime.

2. *The Moisture*:

The compost ferments best when moist, but not sopping wet. If the raw material is dry, wet it down well, before or during grinding.

Guard against moisture losses, by putting the pile in the shade of trees and shrubs. Or cover it with a thin layer of dirt, straw, paper or leaves.

If the pile is too dry, wet it down. If it gets too wet, poke air holes into it with a stick or crowbar. Check up on it; this is worthwhile.

## DRY COMPOST WILL NOT ROT INTO HUMUS

3. *The Temperature*:

The most desirable fermentation takes place when the air temperature is between 55 and 90 degrees F. When the weather is hot, add more water.

Freezing temperatures do not prevent fermentation, they merely slow it up. Frozen chunks of organic matter and earth can be put through the grinder. With the first thaw, the fermentation and break-down will go ahead rapidly.

4. *Size of Piles*:

It is better not to make the piles very high and extremely wide. Excess width prevents air from getting inside to the bacteria which need and want it. But you can make them as long as you wish and space permits. You can also use a compost bin.

Maximum width, 12 to 16 feet; maximum height, 5 feet; always sloping sides in, at a 45 degree angle.

The smallest practical size for a pile is 4 feet wide by 4 feet high. Miniature heaps may dry out quickly in summer. Protect them well.

Machine-ground heaps do not need to be turned. This makes for a saving of space in your compost yard.

5. *Speed of Fermentation*:

The time needed for the material to turn into humus depends on the fineness of the grinding, the mixture, the season of the year, and the moisture content.

We have obtained humus from kitchen garbage, garden refuse, grass cuttings and manure in 10 days. It has taken 15 to 20 days for a mixture of green leaves, dry weeds, and heavy, dry, plant stalks. The dry material was either mixed with wet, juicy matter, or thoroughly wet down.

Straw, dry autumn leaves, and sawdust take a longer time. Materials containing a high percentage of woody fiber need more time to ferment. A special, hot fermentation may be preferable for such woody matter, especially if time is at a premium.

## HOW TO KEEP THE B. D. COMPOST STARTER ALIVE

The B. D. COMPOST STARTER contained the correct moisture content and food for the bacteria when it was packaged. It will live for several months if *kept cool* (*not* refrigerated), and away from direct sunlight. It will *lose its value if it dries out* and/or is heated above 150 degrees F. The polythene bags, in which it is packed, will hold the proper moisture con-

tent until opened. Once they have been opened, it may be necessary to moisten the material from time to time.

| | | |
|---|---|---|
| 2 lb. Units enough for | 1 ton of compost | $ 2.00 |
| 6 lb. Units enough for | 3 tons of compost | 5.25 |
| 10 lb. Units enough for | 5 tons of compost | 8.00 |
| 20 lb. Units enough for | 10 tons of compost | 14.50 |

(The prices listed here are retail prices, include packing and postage.)

Please address all correspondence regarding the B. D. COMPOST STARTER to the Biochemical Research Laboratory, Threefold Farm, Spring Valley, N. Y.

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## WE WEATHERED THE DROUGHT

ESTHER EATON

*The following "experience story" should prove of genuine interest. While, as the author points out, the place described is neither farm nor (in the food-producing sense) a garden, it is a particularly charming home plot. The use of Bio-Dynamics at "The Ledge" should be of interest to great numbers of suburban residents who could find it a similar source of practical satisfaction.*

The drought of the summer of 1949 did much harm along the eastern seaboard. But our home acre suffered slight appreciable damage.

Ours is not a farm and we have not even a vegetable garden, since we are usually away from home in the summer. But trees of many kinds, in cluding apple and pear, shrubs, vines and flowers we have in plenty.

Thirteen years ago we took over the little plot which adjoins the Threefold Farm at Spring Valley, New York. Although our first six months were devoted mainly to clearing away old wire fences, heaps of litter and rubbish and dead trees, we began to make compost heaps at once.

In February, 1937, we did our first planting. We hadn't much compost but we used all we had when a nursery man came to plant some thirty trees and shrubs. We remember, too, that we kept him and his helpers waiting while we stirred Bio-Dynamic preparation, 500, to put into the holes.

Our place stands on a hillside on three different levels. The soil, when we took it over, was friable—indeed too light and dusty—on top, caked hard beneath the surface. Its color was a light reddish tan. It contained no humus and very little life. We noted few if any earthworms and there were serious evidences of erosion on the slopes. The soil had been neglected for years.

We erected compost heaps in a "park," enclosed by high posts and chicken wire. Just outside this we planted half a dozen locust trees for the sake of shade and the aeration their fine root systems produce in the soil. Aside from having had an attack of borers which we corrected as soon as discovered, these trees have flourished throughout the years. In the summer of 1949 rows of locust trees along the main road near us were beset by

a serious blight or pest, possibly worsened by the drought. Our locusts remained in health and vigor.

Over the years we have faithfully made compost, always using the Bio-Dynamic method of constructing the piles and inserting the Bio-Dynamic preparations, 502-507, according to rule. We have made enough compost to transform the soil, almost completely, over our entire acre. Earthworms flourish everywhere. Erosion has been completely checked, even though our drainage is active due to our hillside location. The color of the soil, in most places, is now a rich dark brown many inches deep. Growth of trees and shrubs, vines and flowers has been phenomenally rapid and for the most part the plantings have remained healthy and sturdy.

Use of the Bio-Dynamic spray known as No. 508, and made from Equisetum arvense has banished many of the lesser pests and blights. True, for emergencies created by the Japanese beetle and other violent enemies, commercial sprays have been helpful. But the permanent resistance of our trees, vines and flowers to these onslaughts is without question due to the general health and strength built up by Bio-Dynamic treatment and the use of the two Bio-Dynamic sprays, No. 500 to strengthen root growth and No. 501 to stimulate foliation and flowering.

For several years after we took over, and until our plantings had secured a good foot-hold, constant watering of the place was necessary. Since that achievement, with the exception of two years of serious drought, we have needed to do less and less watering of lawns and flower beds. Some years the garden hose has never been unreeled.

Two years ago there was a prolonged drought in late summer. Several trees suffered seriously. But by application of compost mulch they all recovered except four little pines which had never flourished, partly because our soil was too rich for them and partly because they are not indigenous to our neighborhood. These we had to remove.

The summer of 1949 brought a serious drought in late May, June and early July. From the middle of June to the middle of August we were away from home and the garden was left to the mercies of a young lad who could give only one day a week to its care. The newspapers alarmed us with their accounts of the suffering of the country-side. We wrote of our anxiety to our garden boy and begged for news. To our amazement he replied that conditions were good and that we need not worry. This was confirmed on our return. Not a tree had died or withered, flowers had bloomed, shrubs and vines were green and vigorous and the Japanese beetles had done less damage than in years gone by.

Our garden boy had sprinkled flowers, shrubs and vines once a week but he dared not use any of our limited water supply to water the trees.

What prevented the little place from suffering severely in the drought? We are convinced that it is our Bio-Dynamically prepared soil which, despite drought and heavy drainage, holds the moisture that protects the roots of all our growing things. With smiling faces and grateful hearts, we say, all honor to the Bio-Dynamic method of gardening.

## THE GARDENER'S YEAR
## WINTER

The Christmas Season will be behind you, when this number gets into your hands. But in the hope that the spirit of Yule may be lingering on, we have a proposal: Write about your places, gardens or farms, and about your good or unsatisfactory experiences with Bio-Dynamic procedures and preparations. Don't do it for the editors, but for the readers of this quarterly. It will be a nice post-Christmas present (like one of those living Christmas Trees) that can mean something for a long time to come.

Contributions about experiences have been asked for before, but the response is sparse. Probably it is because people think that what they do is not interesting. And that's a great mistake.

We recall a Winter 15 years ago when we were visiting a whole group of adjoining Bio-Dynamic Farms on the shore of the Lake of Constance. We tramped through the snow with the capable gentleman who conducted the local B. D. Information Center. We came to a fair-sized place owned and run by an elderly couple. She was inside getting lunch ready, and the old farmer was muttering to himself about "the bother" of putting the B. D. tree paste (Miss Speiden will give you the formula if you don't have it) on 200 apple trees. We asked him whether it was the first time he was using it.

"Oh no," he said, in a grudging tone. "I put it on every other year. Have for a good many years."

He went on muttering, and swinging the whitewash brush up and down the trunks—from which loose bark had been neatly scrubbed with a wire brush applied gently enough so as not to injure the cambium.

Well, for us, relatively new to Bio-Dynamics, it was most interesting and convincing. Here wasn't a grumbling hired hand *sent out* to do a job he had no faith in. This was a busy farmer working without help, a man who has more than plenty to do. Complaining about the chore as he was, it was obvious that he'd undertaken it in preference to two dozen other things waiting to be done, for no reason except that his experience had been that it *paid him* to do it.

See what we mean? Do let other people hear from you—grumblings and all if you feel grumbly.

As far as "bother" goes. It's true that Bio-Dynamics involves a few operations not included in pouring chemical fertilizer out of a bag. But if you figure up the amount of weeding and cultivating and harvesting that is necessary to pay for the bags of fertilizer, you will find that B. D. actually does not mean more work. This is all aside from the question of the life and health of soil, plants and animals. In that regard, people who have given the approach a fair and complete trial often feel that it is worth what occasionally seems like extra effort.

* * *

We spoke in the Summer number about making a map, a really accurate one, of the growing garden, so that you would later know exactly *where* all your mixed vegetables had been planted.

Everybody who did that, is in a good spot now. As the sun starts to come back in January and February, and the urge for garden planning stirs deep down inside, you can do an intelligent job of crop rotation. You can, in laying out the 1950 garden, put the heavy-feeders, the more soil-devouring crops (along with good B. D. rotted manure) where the less-demanding plants stood last year. And you can follow last year's heavy-feeders with soil-building legumes—early peas for instance.

And plan your garden according to the composted manure and composted plant refuse (manure and compost, for short) that you have available. Don't spread the stuff too thin. For gardens, ten to twelve tons per acre is a good average figure to use (cubic yards are a more stable measure because organic fertilizer, with its water absorption, weighs much heavier after a rain). A fair rule of thumb would be a heap 6 feet long, 4 feet wide at the base and 3 to 3½ feet high for an area of about 100 by 100 feet. The point we're trying to make is, figure on an adequate dose and if there isn't enough to take care of the land that is open perhaps it will be a good idea to plan on seeding part of it down to an annual legume such as soybeans, field peas, cow peas, lespedeza or Winter vetch (which, you know, grows very nicely in Summer too, although the seed has the disadvantage of being expensive). And please remember that nothing in this column can be more than general thoughts. Each place *is* its own problem, and—for instance—some of the legumes we just mentioned undoubtedly would not do well for you at all. Miss Speiden and other B. D. advisers are there to have a go at your specific questions. So often a lot of grief can be saved by avoiding the mistakes of others.

If you have fruit trees, you do your pruning before you put the tree paste on. And that can start at the beginning of the time of severe cold. Don't do it before the sap is down. The country-bred people in our section do theirs in January and February—but it is preferable to get the protective coating of B. D. tree paste on as soon as possible. If you are pruning in cold weather time—an old rule is, that if it is too cold to work comfortably it's too cold to prune safely, because you injure the bark in clambering around the tree and even leaning your ladder against it, and you may break branches or crack them in the intense cold.

* * *

A farmer friend with whom we were talking about this column of reminders of things we all really know but sometimes don't get to doing, said "Why just gardeners? The farmers can use advice too?" We tried to explain to him that with no disrespect to the home gardener we had a feeling of presumptuousness involved in even trying to remind a man *earning his living from the land* of things he might or might not be doing at one time or another. If he's a good farmer, he'll know that better than anybody else anyway. The commercial grower with greenhouse and gardens is in the same category. We know, at the same time, that Bio-Dynamics can help them with their specific problems—but that is another matter.

Dirt farmers have a lot to tell everybody who is in any kind of contact with the land. Take for instance the matter of keeping goats, which often works in well on a small, country homestead. Some years ago in "The Rural New Yorker" there was a piece with a lot of practical advice about Toggenburgs. And the experienced farmer who wrote it ended his article with words that could have sounded like sentimentality from another source: "Unless you're prepared to give them endless patience and affection, don't go into it." Practical advice, that, as anybody who has had to do with goats has surely found from his own experience.

* * *

The seed catalogues will begin arriving soon. And the very variety of choice offered in each vegetable category can be dizzying. Which brings up a thought: An exchange of experiences on which sort of carrot, corn, bean, beet, etc., you have found most satisfactory, and why, would be interesting to everybody. Do, please, write such things in to Bio-Dynamics. And at the same time give your fellow-gardeners some idea of your climate and the nature of your soil, so that they can see if a particular sort is worth their trying.

"Bio-Dynamics" is *your* magazine. And the more you write it as well as read it, the better it will get to be.

THE EDITORS

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## FROM OUR MAIL BAG

*Miss Evelyn Speiden, secretary-treasurer of the Bio-Dynamic Farming and Gardening Association, Inc., sends us the following:*

*Question*—Are there certain plants, herbs or shrubs that will repel animals from my future garden? I suspect that I will have trouble with 1) woodchucks, 2) rabbits, and 3) deer . . . and in the order named. Fencing will be impractical, and it is about 8 miles from town and I will be there only once or twice each week, so shot-gun will not work.

J. P. B., New York

*Answer*—I do not know of plants that will help with this problem; wish I did, as I've had such trouble myself this summer. One case comes to mind where small animals were kept out of a garden by a single strand of electric fence only a few inches off the ground. Such a thing is easily put up but the grass below it would have to be kept low enough not to touch it. Recently I heard of a garden where deer had been kept out by rags soaked in creosote and hung on a wire surrounding the garden. How close or high, I do not know, but the deer evidently disliked the smell so much they kept away.

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*Question*—How can I keep this 500 until I need it and how long can I keep it?

J. M., California

*Answer*—The 500 can be kept almost indefinitely *if* kept under the right conditions; otherwise it will lose effectiveness within a few days. The point

is to keep it from drying out. Keep it moist, dark and cool as possible. If it once gets dry, wetting again is of no value. In fact it should not be wet directly at all. The best method of keeping is to place in a glass or earthenware (not metal or cardboard) container without too much air surrounding it, and without fastening the top too tightly. Then place the container in moist earth, either outside in a cool, shady place or in a cellar away from machinery,—and *keep* the earth moist.

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*From Mrs. R. E., Hamburg, N. Y. October* 30, 1949

Our garden this year has been the best we ever had . . . all the vegetables we could eat and can for ourselves and we have kept W.'s brother and his wife supplied all summer . . . besides odd things given various friends and relatives. We are still enjoying beautiful lettuce, broccoli, carrots, kohlrabi, chard, beets, endive and cabbage. We had a row of sweet potatoes which did very well, just finished digging them today. Everyone to whom we have given any of our vegetables has noticed a marked difference in flavor and I feel that with a little concentrated effort a market for biodynamic vegetables could be built up in this community.

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*Question*—My garden, lawn and flower beds are rampant with chickweed, garlic and ground ivy. I have never had weeds and do not know how to cope with them. Is my soil too poor, too rich or what do I need? The winter was mild last year and the spring wet. I got home the last of May and found this condition. Pulling seems futile. Ten come up where one was pulled. I could carry out a plan if I knew one.

A. F. G., New Jersey

*Answer*—Never allow weeds to grow on your compost pile as many are spread in this way. To get rid of these you have, the best plan is to mulch your garden heavily next season. Use straw, old hay, half rotted compost, leaves or a mixture of these and whatever material of this sort you can get *in quantity*. Begin mulching after the first cultivation of your young plants and before the summer drought and if you mulch 2 or 3 inches thick, weeds will be choked out or not come up at all.

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*From Mrs. L. L. B., Penna. Nov.* 8, 1949

We have had a wonderful fall. Though the tomatoes are in, the broccoli, celery, beets, carrots, celeriac, lettuce, fennel, escarole, onions, parsley are still flourishing . . . My sister is feeling so much better that she is making things spin. I hope we can make our little spot a Bio-Dynamic model. People are beginning to take notice . . . My sister is so thrilled that her house plants have no more bugs,that she is my best distributor of the good news. And people listen to her. They think I am a newcomer and a faddist.

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*Two Research Centers*

Letters from our readers indicate some confusion as to the relation between the research work of Dr. Pfeiffer at his Bio-Chemical Research Laboratory

at Threefold Farm, Spring Valley, N. Y. under the auspices of the Bio-Dynamic Farming & Gardening Association, Inc., R. D. 1, Chester, N. Y. and that of the Soil and Health Foundation, Allentown, Pa.

The two are not one and the same but separate and mutually independent organizations, the latter under the auspices of Organic Gardening Magazine published by Mr. J. I. Rodale at Emmaus, Penna. A cordial and friendly feeling exists between the two groups which meet "over the compost pile." Dr. Pfeiffer frequently writes for Organic Gardening and recently has completed in his laboratory a feeding experiment with white mice which was financed by the Soil and Health Foundation. Aside from this single experiment, however, the Bio-Chemical Research Laboratory functions independently and welcomes the help of those who have an interest in its work. Since research work is of a pioneer character, it is not the sort of activity which brings in an income sufficient to support itself. Hence those who recognize the importance of the findings are the ones upon whom its existance must depend. Many friends have rallied to the support of Dr. Pfeiffer's unique work, and only because of such help, has it been able to continue. To those who contribute he sends a report of progress and of the financial situation of the laboratory. Contributions—specified for research—should be sent through the Bio-Dynamic Farming & Gardening Association, Inc., R. D. 1, Chester, N. Y., and may be deducted from income tax since the Association is recognized by the Federal Government as an educational organization.

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*Classy!*

As a magazine "Bio-Dynamics" may be in a class by itself—otherwise you would not be subscribing to it. And so we hesitate to mention the fact that the post office does not think so. It's not even first class with them, but only third, along with all the other magazines that do not get forwarded unless you have left forwarding postage. What puzzles us most is that you can go away for a vacation, even move away, and so far forget your "Bio-Dynamics" as to neglect leaving that forwarding postage! Or sending us a postcard with your change of address! Or arranging to have your third class matter left or held at some definite place until your return! But strangely enough, you sometimes do. Well, perhaps not as often as with other magazines, for "Bio-Dynamics" readers are an unusually intelligent, thoughtful and cooperative group (and we aren't fooling). However, when it happens, the post office slaps on a 3c due postage stamp and sends it back to us. Then we spend some time wondering what to do with it. Or we may put it in another envelope with still another 3c stamp and risk another trip for it, for sometimes the post office does jot down another address when they return it, and sometimes we can read what they write,—but not always. Meanwhile you are home again perhaps, and the other post office keeps it awhile and then throws it away. At any rate about four months from then we hear from you, "My Autumn number of 'Bio-Dynamics' has just arrived. It certainly is a splendid issue and I am enjoying it thoroughly. I have been missing it and wondered if you had stopped publica-

tion as I never received any summer number. Could you possibly send me the missing number as I want very much to keep my files complete?" And so we do, even though it has now cost us over 40c additional to supply your missing link. If the price of "Bio-Dynamics" goes up sometime, don't be surprised. If we don't answer your letter as quickly as you like, just remember we are chasing down someone else's address.